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A Monthly Review of Veterinary Science.

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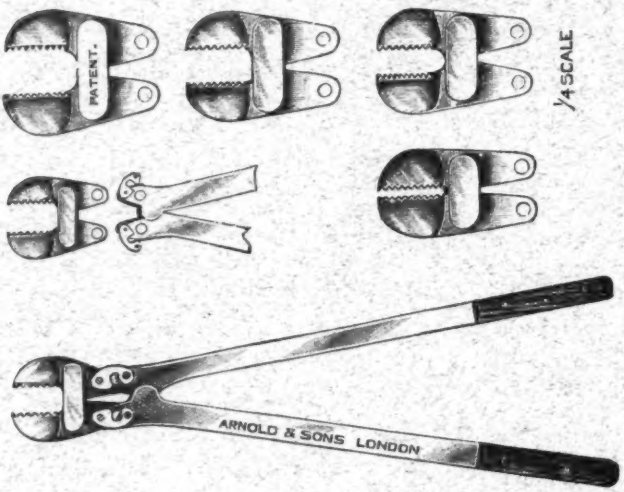

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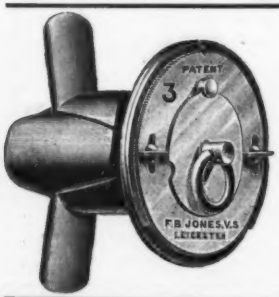

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PROFESSOR LIGNIÈRES,

Director of the National Bacteriological Institute, Buenos Ayres, South America.

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THIS well-known veterinary surgeon was born on July 26, 1868, at St. Mihiel, in the Department of the Meuse in France, and was educated at the Lycée Charlemagne in Paris. Joining the National Veterinary School of Alfort in 1886, he left in 1890, passing out with honours, and in the same year competed successfully for the appointment of lecturer on contagious maladies, public health, forensic medicine, and jurisprudence.

In 1894 he was appointed Principal Demonstrator in the same Faculty, and later on his chief—Professor Nocard—entrusted him with the direction of the courses in jurisprudence, legal medicine, and bacteriological technology.

In 1897, on the recommendation of Professor Nocard, M. Lignières was sent by the Pasteur Institute of Paris to investigate the infectious diseases of cattle in the Argentine Republic, and in 1897 he founded the Bacteriological Institute of the Ministry of Agriculture in Buenos Ayres, being appointed Director.

Professor Lignières subsequently became Professor of Contagious Diseases and of Bacteriology to the Faculty of Veterinary Science and Agriculture on its establishment in Buenos Ayres. He is also a member of the Société Centrale de Médecine Vétérinaire de Paris, and of the Zoological Society of France, besides being an Academician of the Veterinary Faculty of Buenos Ayres, and one of the South American representatives on the Permanent Committee of the International Veterinary Congress.

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Among his writings should be mentioned:—

"Studies of Typhoidal Affections in Horses and of Infectious Pneumonia"; "The Streptococcus of Schültz"; "Study and Classification of Septic Hæmorrhagic Pasteurellosis"; "Study of Hog Cholera and Classification of Salmonellosis"; "Etiology and Serotherapy of Anasarca in Horses"; and "Studies of Bovine Piroplasmosis," whilst in 1901 he demonstrated for the first time that there are many kinds of piroplasms.

Other writings deal with "Polyvalent Vaccination against Bovine Piroplasmosis," "The Improvement of Cattle in Piroplasmic Zones," "Argentine Anaplasmosis," "A Study of Mal de Caderas," "Actinomycosis," "Actinobacillosis," the latter work in collaboration with Dr. Spitz. Professor Lignières also wrote, in collaboration with Dr. Ramon Bidart, "A Study of Symptomatic Anthrax in Argentina," "A Study of Epizootic Abortion," "A Study of Local Reactions under Tuberculin Treatment," "The Failures of Tuberculin," in which he considers the association of reactions for the avoidance of frauds and for the assurance of more complete diagnosis. Among other works are "Studies on Anti-tubercular Vaccinations in the Struggle against Tuberculosis," "Studies of the Bubonic Plague," &c.

His books have brought him much honour and many substantial rewards:—

In 1899 he gained the Monbine prize, and in 1901 the Barbier prize of the *Académie de Médecine de Paris*. In 1900 he gained the Monthyon prize of the *Académie de Sciences de Paris*. The National Society of Agriculture of Paris, The "Société Nationale d'Acclimatation," and the Society of French Agriculturists, have all awarded him gold medals. At the International Exhibition of Buenos Ayres, which commemorated the Centenary of the Argentine Republic, he obtained the first prize for his serums and vaccines. He achieved a similar success at the International Exhibition of Agriculture. In addition to all his other distinctions Professor Lignières is a Chevalier of the Legion of Honour and a Chevalier of the "Order of Merit" in Agriculture.

Editorial.

THE HUMANE SLAUGHTERING OF ANIMALS REQUIRED FOR FOOD.

The members of the veterinary profession are more fitted by their special training and knowledge of anatomy than those of any other body to sit in judgment upon such an important subject as the humane killing of animals, and it is only their foolish and innate sense of modesty which has caused them to allow others to take the leadership which by right should belong to them. The average Englishman is by nature kind-hearted, and to inflict pain is foreign to his nature. As proof of this we have the high position which is occupied by the various societies who make it their business to protect animals from cruelty, and although for a long time ordinary cruelties have been sought for and redressed, it is only lately that a determined effort has been made on behalf of the animals used for food. That their destruction is necessary is an unfortunate fact, and that it is the solemn duty of man to accomplish this in as humane a manner as possible is also as undeniable a fact, but whether it is always done in the quickest and most painless manner is a matter for question. Certainly in the case of some of the smaller animals, especially the pig and sheep, there is room for much improvement, and even in the ox the method of causing death is not always as speedy and painless as it might be. Of the Jewish method of slaughtering oxen the less said the better, although why it cannot be forbidden by law in this country, as it has already been done in some other civilized countries, is a point upon which many people have made arguments. Certainly the whole scene of the fixing down and killing of a bullock as ordered by the Jewish rites is revolting and brutal to a degree. Where death is a necessity let it be speedy and not preceded by a scene of terror or the administration of forcible pain. We, as veterinarians, have a very earnest duty to perform, and more than any other body of men ought to urge upon Parliament and the general public the claims of animals to be dealt with in as humane a manner as possible; also, above all, we should endeavour to the best of our ability to show by what we do ourselves that our actions are humane, as humane as possible in consistency with safety. In the use of anæsthetics for operations and in our methods of painless destruction for our patients, when life is hopeless and no longer endurable, we should be right in the forefront. It is not only our right and our privilege, but a duty we owe to humanity, to the general public, to the animals of which we make a special life-study, and to ourselves. Let us then look to it that we are not wanting when our advice is sought upon the subject of the humane work in which we are supposed to have been trained, for it is our duty to know the whole alphabet of the subject, from Alpha to Omega.

General Articles.

FURTHER EXPERIMENTS WITH THE *MYCOBACTERIUM ENTERITIDIS CHRONICÆ PSEUDOTUBERCULOSÆ BOVIS*, JOHNE, AND WITH VACCINES PREPARED FROM THIS MICRO-ORGANISM.

By F. W. TWORT, M.R.C.S.Eng., L.R.C.P.Lond.,
Superintendent of the Brown Institution, University of London.
AND
G. L. Y. INGRAM, M.R.C.V.S.,
Late Veterinary Surgeon to the Institution.

In 1910 we published a preliminary note on the cultivation of the *Mycobacterium*, often known as Johne's bacillus, and in November, 1911, communicated details of these experiments to the Royal Society, London; these were published in the early part of this year. In this paper we gave a description of the disease, and an account of the various attempts made by previous workers to cultivate the specific micro-organism. We also gave details of our own experiments, the formulæ of the various media on which we had succeeded in growing the micro-organism, the successful inoculation into bovines, and the preparation of vaccines, &c. It may be repeated that the essential constituent of our media consisted of the dead bodies of allied acid-fast bacilli; or various alcoholic, glycerine and other extracts obtained from such bacilli. A good medium consists of egg 75 c.c., 0.85 per cent. NaCl 21 c.c., glycerine 4 c.c., and dried killed *Bacillus Phlei* (the Timothy grass bacillus) 1 grm.

Dr. Holth, working in Professor C. O. Jensen's laboratory in Copenhagen, has published a series of experiments which confirm these results.

In our present paper we propose to deal with a few of the points mentioned in our last; these are:—

(1) The nature of the essential substance in the allied acid-fast bacilli necessary for the growth of Johne's bacillus.

(2) The possibility of growing Johne's bacillus on the bovine type of tubercle bacillus as well as on the human type.

(3) The possibility of acclimatizing Johne's bacillus to grow without the presence of the dead bodies or extracts of allied acid-fast bacilli.

(4) Johne's bacillus with special reference to the growth on the surface of fluid media.

(5) The possibility of communicating the disease to animals other than bovines.

(6) Vaccines with special reference to a reliable and specific diagnostic reagent.

(1) The Nature of the Essential Substance in Allied Acid-fast Bacilli.

In our last R. S. paper we noted, that if any of the bacilli used for preparing the media were extracted with alcohol in a Soxhlet's apparatus for three or four hours, the residue was no longer suitable for making an efficient medium for growing Johne's bacillus; but that the necessary substance was contained in the alcoholic extract. We noted further, that the extract could be divided into three portions, none of which were purified.

(*a*) A part soluble in hot alcohol but practically insoluble in cold.

(*b*) A part soluble in hot and cold alcohol and chloroform.

(*c*) A part soluble in hot and cold alcohol and water but practically insoluble in chloroform.

On media containing any of these parts we obtained growths of Johne's bacillus. We have recently attempted to purify substances contained in these three portions. The portion insoluble in cold alcohol has been freed from the remaining portions by repeated dissolving in hot alcohol and precipitating by cooling. The comparatively pure white wax separated was made up into media in various percentages, the basis of the media consisting of egg, glycerine and 0.85 per cent. NaCl as given above. These media gave uniformly negative results, proving the positive results previously obtained to be due, as we presumed, to an admixture of one or other of the remaining parts.

The portions (*b*) and (*c*) have also been investigated, but so far we have been unable to separate the essential substance in a pure state. However, we are inclined to think that it forms only quite a small part of the extracts (*b*) and (*c*), for the following reasons. It is possible to grow *B. Phlei* and allied bacilli in such a way that they are quite unsuitable for adding to media for growing Johne's bacillus. If a quantity of dried *B. Phlei* be extracted with alcohol as above, and the portions of the

extract (*b*) and (*c*) added to the egg medium in the usual percentages, *i.e.*, ¼ to ½ per cent., they may prove to be unsuitable. That this is not due to any deleterious substance can be proved by placing a higher percentage of either of the extracts in the medium, when Johne's bacillus will grow. It may also be noted that the portions of the extract (*b*) and (*c*) are either both suitable and good, or both unsuitable, and that a good bacillary powder always gives a good extract, proving that the unsuitability of any particular extract is not due to any error in extracting. We are indebted to Dr. E. Mellanby for preparing the fatty acids from the alcoholic extract of the *B. Phlei*. The fatty acids freed from other substances gave negative results when incorporated in the medium.

In carrying out these experiments we have tested large quantities of material, and have often extracted 50 grm. of dried *B. Phlei* for a single experiment. It is also worthy of note that, if dried powders of human and bovine strains of tubercle bacilli are extracted with alcohol, the bovine type gives a good yield of extract which is also divisible into three portions like the human type, yet only the human type of bacillus or its extracts produce suitable media for Johne's bacillus. The experiments detailed above strongly suggest that the essential substance—whatever it may be—is quite specialized, and only present in small quantity even in the two portions of the alcoholic extract which are soluble in cold alcohol.

As to the formation of this substance by such bacilli as the *B. Phlei*, it is quite clear, in view of the variations in quantity noted, that the conditions of growth must play an important part in determining its production. It will be necessary to exercise caution in setting down definite conditions suitable for a maximum production, as so many factors may come into play; but certainly the medium on which the *B. Phlei* is grown, the time it is grown, and the temperature of the incubator are important points; the constitution of the medium being probably the most important. Ordinary glycerine peptone beef broth proves to be a suitable medium. We have used glycerine liver broth considerably, and although, as is well known, most acid-fast bacilli grow better on broths prepared from liver than on those prepared from muscle, yet *B. Phlei* grown on liver broth does not appear to make such good media for Johne's bacillus.

(2) The Possibility of Growing Johne's Bacillus on the Bovine Type of Tubercle Bacillus.

In our last paper we observed that, although the human type of tubercle bacillus was suitable for preparing the special medium, the few strains of bovine type we had tested proved to be unsuitable, all the media prepared with the bovine type giving negative results with Johne's bacillus. We have since tested several more strains of the bovine type, and from these experiments we are inclined to think that this type may contain a very small quantity of the essential substance, if grown under certain conditions. Our results were obtained with a tubercle bacillus isolated from a child's ear, but showing the characters of the bovine type. The bacillus was grown on egg medium at 40° to 42° C., and the bacillary powder or its alcoholic extract was added to the egg medium in double the usual quantity. Such media gave a slight growth when inoculated with Johne's bacillus. This observation, although interesting, does not alter our previous contention that the bovine type is quite unsuitable for making an efficient medium. It must also be remembered that our strains of Johne's bacillus have now been cultivated outside the animal body for some time, and are becoming acclimatized to artificial media, as further observations have proved.

(3) The Possibility of Acclimatizing Johne's Bacillus to grow on Media without the Presence of the Dead Bodies or Extracts of Allied Acid-fast Bacilli.

This possibility was discussed in our last paper. So far all our strains, with one exception, have resisted every attempt in this direction. However, one strain that has now been growing outside the animal body for 18 months, and which was the first to give a surface growth on fluid media containing extracts of *B. Phlei*, has recently shown growth on a flask of ordinary alkaline glycerine peptone liver broth containing no extract of allied acid-fast bacilli. The flask was inoculated in January, 1912, with the surface growth of Johne's bacillus from a flask of glycerine liver broth containing dead *B. Phlei*. No evidence of multiplication was observed for four months; the bacilli then started to grow, at first slowly, and later more rapidly. Subcultures made on to fresh flasks of the same medium have also started to grow. The original culture has since been used as

a diagnostic vaccine, and the results are given at the end of the section on vaccines. In this experiment it is possible that a small mutation has taken place, and we anticipate that in time sub-cultures will grow even more vigorously, and that our remaining strains of Johne's bacillus will mutate, or vary, in the same direction.

(4) Johne's Bacillus with Special Reference to the Growth on the Surface of Fluid Media.

At the time of publishing our last R. S. paper we had been able to get only one of our five strains of Johne's bacillus to grow on the surface of fluid media; but, as we predicted several more have since commenced to form film growth, and we expect that all strains will show the same character if cultivated for a sufficient time on artificial media. The growth is thick and irregular on the surface, but very slow to spread. Recently, Holth has been rather more successful than ourselves in obtaining surface growth, and in his paper draws attention to the characteristic thick knobby but slow growth on such media. He used broth made from liver that contained a glycerine extract of the tubercle bacillus, and often added a certain quantity of fresh serum, which he maintains further improves the medium. We found that it did not improve our original egg medium, so we performed no further experiments on these lines until a few weeks ago, when we tested dog's ascitic fluid with liver agar containing an extract of *B. Phlei*. The ascitic fluid was added fresh, without heating, just before setting the agar; for one batch the fluid was first passed through a Doulton porcelain filter. This series of experiments showed the agar to be improved by the addition of the fluid, especially when it was filtered before adding to the agar.

(5) The Possibility of Communicating the Disease to Animals other than Bovines.

We have performed a considerable number of experiments to test the pathogenicity of Johne's bacillus on various animals, and have published results which show that Johne's disease can be given to bovines by inoculating pure cultures of the bacillus intravenously and by feeding the animals. On the other hand we failed to communicate the disease to rabbits, guinea-pigs, rats, mice, pigeons, and hens. Since the publication of these

results we have succeeded in giving Johne's disease to bovines by inoculating cultures of the bacillus into the peritoneal cavity and by means of a subcutaneous inoculation, we have also succeeded in giving the disease to a goat by inoculating a pure culture into the peritoneal cavity and to another goat by means of an intravenous inoculation. The diagnosis and *post-mortem* proof of these results are given in the discussion on vaccines. It may be noted here, however, that S. Stockman has observed a condition occurring naturally in a sheep, which is indistinguishable pathologically from Johne's disease; at that time the bacillus had not been grown, so that the exact nature of the micro-organism observed in the sheep was not determined. Since our results prove that a strain of Johne's bacillus actually isolated from a cow can give the disease to the goat, we consider it probable that it can be transmitted to other horned animals, and the condition observed by Stockman in sheep is probably caused by the same identical micro-organism. We have attempted to inoculate two sheep, but cannot yet say with what result.

(6) The Production of an Efficient and Specific Diagnostic Vaccine for Johne's Disease.

In our last paper we discussed various curative and diagnostic vaccines for Johne's disease, and pointed out that one of our vaccines, prepared by growing Johne's bacillus on broth containing 1 per cent. of human tubercle bacilli, gave a marked reaction with an animal suffering from Johne's disease + tuberculosis and with those animals suffering from tubercular disease only. This and other experiments proved to us that the medium used was unsuitable for the preparation of a specific diagnostic vaccine. From further experiments we were led to recommend *B. Phlei* as the most suitable for the preparation of media, and we prepared some vaccines on these lines, but the only animal we had the opportunity of testing at the time was a Jersey bull, which gave a negative reaction, probably due either to the disease being very far advanced or the dose of vaccine being too small.

In Holth's paper will be found some experiments with a vaccine prepared by growing Johne's bacillus on a medium containing a glycerine extract of the tubercle bacillus. A series of calves were inoculated with cultures of Johne's bacillus, and tested some months later with tuberculin with negative results.

They were then tested with the special vaccine, and all showed some rise of temperature, while one gave a "typical reaction," the author, however, does not give the rise of temperature obtained. This result in an animal apparently free from tuberculosis is interesting, but as we have already indicated we consider that a diagnostic vaccine for Johne's disease is certain to be more specific if *B. Phlei* be used in place of the tubercle bacillus. It is probable, however, that if Johne's bacillus can be acclimatized to grow sufficiently well on ordinary glycerine broth made from beef or liver, then such a vaccine should be even more specific, and it will be seen from one result already obtained, which is given at the end of this section, that the vaccine so prepared, although weak, nevertheless produced a definite rise of temperature in the animal.

From our knowledge of group reactions in general, and from the recent work of C. C. Twort on the relation of Johne's bacillus to other acid-fast bacilli carried out by means of complement deviation and agglutination tests, it is improbable that an absolutely specific vaccine will be obtained, although, if properly prepared, a vaccine of Johne's bacillus should be sufficiently specific for practical purposes, and in fact as specific as tuberculin is for tuberculosis.

We have recently tested a fresh batch of vaccine, prepared by growing Johne's bacillus on ordinary glycerine peptone beef broth containing a glycerine-saline extract of *B. Phlei* (the Timothy grass bacillus). This culture was grown for nine months at 39° C., the whole was well shaken to form an emulsion of the bacilli, placed unfiltered into small flasks, and heated for one hour at 62° C. The vaccine was first tested on three fully grown bovines and on five calves about seven months old, and was inoculated intravenously in doses varying, according to the size of the animal, from 5 to 10 c.c.

No. 1, a Jersey bull, No. 2 a Shorthorn cow, and No. 3 a Jersey cow, all showed clinically the typical manifestations of advanced Johne's disease which they had contracted naturally. All had been tested on several occasions with diagnostic tuberculin with negative results; each animal received 10 c.c. of the special vaccine. No. 1 gave a maximum temperature of 105° F which was reached an hour after inoculation. No. 2 gave a maximum temperature of 106.1° F. five hours after inoculation,

and on the following day developed a violent diarrhœa which persisted after the temperature had fallen. No. 3 gave a temperature of 104.8° F. This was reached in four hours, and the temperature was not taken again; the temperature was accompanied by diarrhœa. We consider all these reactions positive.

Bovine No. 3 died three weeks after the inoculation, and on *post-mortem* examination showed the typical lesions of Johne's disease. The gut was very congested, and some hæmorrhages were present. There was no evidence of tuberculosis.

The five calves were inoculated with living cultures of Johne's bacillus about six months ago, when each received an emulsion of growth from one tube of egg medium. The strain used was that which we had isolated from the intestine of a calf in which we had produced the disease by the inoculation of a pure growth of bacilli; this calf and culture were described in our last paper. Of the five calves inoculated with this culture, Nos. 1 and 2 were injected intravenously, Nos. 3 and 4 intraperitoneally, and No. 5 subcutaneously. The animals did not thrive well, but showed no clinical manifestations of Johne's disease. All were tested with the vaccine described above about six months after the inoculation with the living cultures; calves 2 and 3 each received 3 c.c., and calves 1, 4, and 5 each 5 c.c. The following results were obtained: calves 2 and 3 showed no rise of temperature in six hours, and through an error were not tested again until twenty-four hours after the inoculation when the temperatures were normal. The temperature of calf No. 1 rose to 104.6° F in three hours, that of calf No. 4 to 105° F in six hours, while calf No. 5 showed no rise in ten hours, but when taken the following morning—twenty-four hours after the inoculation—the temperature registered 105.4° F, and was dropping.

A few days after the vaccine tests the five calves were killed, and *post-mortem* examinations performed with the following results:—

Calf No. 1, that had reacted to 5 c.c. of vaccine in three hours, showed the typical lesions of Johne's disease in the intestines and mesenteric glands; the bacilli were most numerous in the tissues of the ileo-cæcal valve, but were also present beneath the mucous membrane of other parts of the gut, and in the glands. The animal showed no evidence of tuberculosis.

Calf No. 2, that had failed to react to 3 c.c. of vaccine within

six hours, showed slight lesions of Johne's disease in the intestine, and the mesenteric glands appeared somewhat larger than normal. Several acid-fast bacilli were found in the mesenteric glands and a few beneath the mucous membrane of the ileo-cæcal valve. No tubercular lesions were found.

Calf No. 3, that failed to react to 3 c.c. of vaccine, showed typical tubercular bronchial glands, but no evidence of Johne's disease.

Calf No. 4, that reacted to 5 c.c. of vaccine, giving a maximum temperature in six hours, showed tubercular bronchial glands which were caseous, and in places, calcareous. Johne's disease was present in a moderately advanced stage, the bacilli in the intestinal wall, as is usual, were most numerous in the region of the ileo-cæcal valve. The disease in the glands was particularly well marked, due probably to the method of inoculation. Films from the glands showed a fair number of Johne's bacilli.

Calf No. 5, that had reacted to 5 c.c. of vaccine some time between the eighteenth and twentieth hours, was small and emaciated. It showed typical tubercular bronchial glands and early tuberculosis in the apex of the right lung. There was no definite thickening of the mucous membrane of the intestine, and the mesenteric glands were not much enlarged. Very few acid-fast bacilli were found beneath the mucous membrane of the ileo-cæcal valve, and several in one of the mesenteric glands.

All five calves showed some congestion of the mucous membrane of the intestine with occasional hæmorrhages, and a few of the glands showed hæmorrhages. This condition which was present only in a slight degree in calf 3, was probably caused by the vaccine inoculated.

Cultures were made from beneath the mucous membrane of the intestine and from the glands of all the cases, and the bacilli grew on the special media in all except calf 3.

From the results detailed above it is clear that the vaccine, prepared by growing Johne's bacillus on a medium containing extracts of *B. Phlei,* will cause a definite reaction in animals suffering from Johne's disease if the vaccine be given intravenously. In only one animal with the disease, calf No. 2, did we fail to observe a definite reaction; this may have been due to the early stage of the disease, but as we have pointed out, the

temperature unfortunately was not taken between the sixth and twenty-fourth hours, and the calf may have reacted during that interval.

We now tested the vaccine by means of subcutaneous inoculations, and as we had no more bovines at our disposal we used goats. In July, 1911, we inoculated two goats, one-month old, with a livng culture of Johne's bacillus. The growth from one egg medium tube was made into an emulsion with 10 c.c. of 0.85 per cent. sodium chloride. Goat No. 1 was inoculated intravenously with 3 c.c. of the emulsion, and goat No. 2 was given 1 c.c. in the peritoneal cavity. At the time of testing the vaccine, which was eleven months after the inoculation of the living culture, goat 1 was thin, but otherwise there were no clinical manifestations of the disease, and the temperature of both was normal. Each animal received 3 c.c. of the vaccine subcutaneously. The temperature of goat No. 1 rose to 106.4° F. in nine hours, reached 106.6° F., and remained above 106° F. for over eight hours, and was accompanied by some diarrhœa. The temperature of goat No. 2 rose to 105° F. in nine hours, and 105.4° F in ten hours, but was not accompanied by diarrhœa.

Both animals were killed and *post-mortem* examinations made. Goat No. 1 showed typical Johne's disease throughout the intestine and in the mesenteric glands. The bacilli were present in fair number. Goat No. 2 showed the disease in a very early stage, and several bacilli only were found. The experiments with these animals show, not only the efficacy of the vaccine when inoculated subcutaneously, but also the susceptibility of goats to Johne's disease.

As a final experiment we prepared a vaccine from the flask of ordinary glycerine liver broth on which we had obtained some growth of Johne's bacillus. The growth was well shaken and allowed to sediment. The fluid was then pipetted off and placed into small flasks; these were sealed and heated in a water-bath at 62° C. for one hour. The vaccine was tested subcutaneously in 10 c.c. doses on two of the bovines mentioned above that had given a definite reaction with the first special vaccine. With bovine No. 1, where the interval between the two tests was twenty-five days, the temperature rose from 102.2° F. to 104° F. in three hours. With bovine No. 3, where the interval between the two tests was only sixteen days, the temperature rose 1° F.

We consider the reaction obtained with bovine No. 1 to be satisfactory, as the vaccine was weak, and we anticipate that as soon as the bacillus will grow more vigorously on media which do not contain any extract of other acid-fast bacilli, then vaccines prepared from such growths will be as efficient as the first vaccine tested.

In conclusion, it should be noted that in all the positive results, with one exception, obtained with the special vaccines, the rise of temperature took place within nine hours.

Most of the expenses of these researches have been paid out of the interest of the Dixon fund, for which we are indebted to the University of London, and we have to thank the Royal Society for the Government grants which enabled us to purchase many of the animals. We are also indebted to Mr. De Vine, Mr. Gold, and Mr. Wilkinson, veterinary surgeons for sending us naturally infected animals.

Conclusions.

(1) *B. Phlei* used in preparing media for growing Johne's bacillus can be grown in such a manner as to contain very little of the substance on which the growth of Johne's bacillus depends. This "essential substance" forms only a small part of an alcoholic extract of *B. Phlei*. Johne's bacillus will not grow on media containing the wax separated out from the extract nor on media containing the fatty acids.

(2) Johne's bacillus may grow slightly on media containing certain strains of tubercle bacilli having bovine characters, and it is probable that the "essential substance" which is present in the human type of tubercle bacillus may also be present to a slight extent in the bovine type, although the bovine type never makes an efficient medium.

(3) After growing outside the animal body for over a year one strain of Johne's bacillus has been acclimatized to grow slowly on glycerine liver broth without the presence of the dead bodies or extracts of other acid-fast bacilli.

(4) At the time of publication of our second paper only one strain of Johne's bacillus showed surface growth on fluid media containing extracts of other acid-fast bacilli. More recently several of the remaining strains have commenced to form film growth on such media.

(5) Johne's bacillus can produce the disease in goats as well

as in bovines, and it is probable that other horned animals can take the infection.

(6) A diagnostic vaccine for Johne's disease prepared by growing the bacillus in a fluid medium containing the dead bodies or extracts of the human tubercle bacillus is not specific but, as we pointed out in a former paper, will also give a reaction with tubercular animals. If *B. Phlei* is used in place of the tubercle bacillus in preparing the medium, Johne's bacillus will grow better, and a diagnostic vaccine can be obtained which is both efficient and sufficiently specific for practical purposes. Moreover, Johne's bacillus has recently started to grow on ordinary glycerine liver broth without the presence of extracts of other acid-fast bacilli, and a comparatively weak vaccine prepared from the culture has produced a definite rise of temperature in a bovine suffering from Johne's disease. In future it should be possible to prepare a sufficiently strong diagnostic vaccine by growing the bacillus on glycerine liver broth or on glycerine beef broth as is done in the preparation of Koch's tuberculin.

In a positive reaction the rise of temperature usually occurs between the third and ninth hour, and may be accompanied by profuse diarrhœa.—*Centralblatt für Bacteriologie.*

FOOT-AND-MOUTH DISEASE.*

By Professor B. BANG.
Copenhagen.

Foot-and-mouth disease is an acutely infectious disease which chiefly attacks ruminating animals and pigs. It is said also to infect horses, dogs, and cats, and even poultry, but such cases are extremely rare and have probably never occurred in this country. Man is attacked occasionally, but, fortunately, not often. Cattle, pigs, and sheep are the animals which are most affected by it.

Symptoms of the Disease.

From three to six days, as a rule, elapse from the time of infection (but in some cases from two to ten days, and in the

* This article, abstracted from the *Journal of the Board of Agriculture*, is substantially a paper read before a meeting at the Royal Veterinary and Agricultural College, Copenhagen, on October 16, 1911, and translated from the *Ugeskrift for Landmaend*, Nos. 43 and 44, 1911. It contains, however, some recommendations and additions kindly made by Professor Bang at the Board's request.

case of the pig only one day), before the animal sickens. It is a sort of exanthematic fever—akin to small-pox, measles, scarlet fever, and the like—that is to say, the disease begins with an ache throughout the system, and the fever, which after one to two days is followed by an eruption. When this has come to a head the fever almost or entirely ceases.

The first symptom is, therefore, that the animal seems unwell, eats less, and, if it is a milch cow, gives less milk. The temperature rises at once, to 40 or 41° C. or more in a cow, but this fever lasts only a couple of days, and in slight attacks it may be quite low. Vesicles or bladders begin to form in the mouth, and occasionally on the lips, snout, and nostrils, on the skin round the hoofs—in cattle mostly in the cleft between the hoofs, and in pigs mostly immediately above the hoof on the outside, and in the skin of the foot joint. In many cases the skin round the teats is also attacked, and occasionally eruptions occur in the vagina of female animals.

The eruption consists in the formation of surface vesicles, the epidermis or the epithelium of the mucous membrane being lifted up in many places by an exuded watery liquid. The vesicles are small at the start, but usually increase quickly in size; this is especially the case in cattle, and this fact seems to have some connection with the fact that the epidermis of these animals is very thick, especially between the hoofs and on the tongue, so that it offers great resistance against the exudation pressure. The acute exudation, of course, causes pain, with the result that the animal goes lame, limps badly on the affected limbs, shakes its feet, lies down a great deal, and is unwilling to rise. Sheep and pigs sometimes creep about on their knees. Cows seem afraid to eat, keep the mouth shut, and make a loud smacking noise with their lips. Saliva forms in the mouth, and dribbles out in strings. If the cow's mouth is opened—a process which she is apt to resist—the vesicles above-mentioned will be seen. They occur mostly on the surface of the tongue, especially on the flat part in front, but also on the thick part farthest back. The number of bladders or vesicles is not large as a rule, often only five or six, but frequently they increase quickly in size. They are usually the size of a shilling or a half-crown, and sometimes attain a couple of inches in diameter. Large vesicles are likewise often to be found in the fore part of the toothless gums of the upper jaw,

and smaller ones on the inside of the lips, on the palate and cheeks, and less often on the underside of the tongue. As the epithelium on the back of the tongue is very thick it cannot be determined at first whether it really is a case of vesicles, but the eruption takes the form of large flat lumps covered by an apparently normal epithelium. If one tears a hole in one of these lumps, a clear liquid comes out. The epidermis can be loosened for some distance (sometimes one can tear away a piece of "skin" a couple of inches in diameter from the front part of the tongue), revealing a red—often very red—sore which is very apt to bleed. This exposure of the naked mucous membrane causes the animal sharp pain, which it shows by shaking its head violently, and at times it is driven quite wild. A little later the bladders burst by themselves without any such interference, and the loosened epithelium is detached, leaving large red sores. Often, however, the epithelium remains hanging on to either side of the sore, and in its macerated whitish state is then apt to present some resemblance to a loose croupous deposit.

Approximately the same process takes place in the cleft between the hoofs. Here the bladders or vesicles mostly begin at the back, but, as a rule, they combine into one immense bladder, which extends throughout the length of the cleft, and after it has burst and shed the whitish-yellow "boiled" looking epidermis a large red sore is exposed.

On the teats the vesicles may at first be very small but numerous. Often there is an annular vesicle round the mouth of the teat itself. The eruptions when occurring on the teats often combine into large, flat, somewhat flabby, irregular vesicles of a whitish-yellow colour. These are naturally easily torn in milking, and the epidermis soon cracks, as it is very thin at this point. The bladders are here also succeeded by reddish surface sores, which take some time to heal on account of the milking.

In other respects it may be said to be characteristic of the disease that it is very superficial. It amounts to a simple raising of the epidermis or epithelium of the mucous membrane caused by a serous exudation. There is no deeply-rooted inflammation of the mucous membrane or corium; the sore simply consists in the laying bare of the surface of these parts, and it has a natural tendency to heal quickly. In a case of a deep sore which destroys the corium or mucous membrane itself the healing may be effected

by the sore being filled with granulations, and the final healing may take place very slowly through the epidermis gradually stretching out from the sides; but in foot-and-mouth disease there are always small patches of cellular tissues at the base of the sore (down between the papillæ of the mucous membrane), and the sore may therefore in a very short time be covered with newly-formed epidermis over the whole surface simultaneously. Thus it is found that these large sores can heal in eight days or less. The locality of the sore may, however, be traced for some time by a smooth, slightly depressed, thin-skinned patch, as, of course, some time elapses before the epidermis reaches its normal thickness.

Owing to secondary infection of the sore more severe inflammation may of course arise later, but this occurs extremely seldom in the mouth, especially when the animal is given suitable soft and clean fodder, whilst it is more apt to happen when the disease attacks the feet, especially the hind legs, and when the animal stands in manure or dirt mixed with urine, as, for instance, in dirty stalls without litter. Under such conditions deep gangrenous inflammation of the skin between the hoofs, sometimes even involving the tendons and joints—the malignant panaritium —is frequently met with, and is due to infection with the necrosis bacillus, which occurs so largely in manure. Other bacteria can, of course, also enter the sore and give rise to inflammatory processes.

The teat sores may, as above stated, become irritated by the milking, and they are also liable to be infected when the animal's litter is dirty, and deeper sores may thus be formed, which will heal slowly. But what is more dangerous still, bacteria may penetrate from the sores which frequently form on the tips of the teats into the lactiferous ducts and cause inflammation of the udder, which often leads to the destruction of one or more quarters.

Apart from these complications, which, under favourable conditions, and when the animal is well looked after, are not very frequent, the disease is usually not a dangerous one. The cow attacked by it is usually very ill for some days, eats little or nothing, gives little milk (which on the other hand contains more fat than under normal conditions), and becomes very emaciated; but about three to four days after the mouth complaint has begun

she begins to eat well again, she grows fatter, and resumes giving a satisfactory amount of milk. The foot lesions often cause inconvenience a little while longer, but, given favourable conditions, these also heal surprisingly quickly, and most animals seem quite well again after one to two weeks.

Sheep and pigs usually have less violent attacks than cattle, and they are more liable to the foot disease than to the mouth disease, which often escapes notice. Pigs, however, often shed the entire horn of one or more hoofs, especially when affected animals are forced to walk.

Necessity for Drastic Action.

In these circumstances, is it not a very mild disease which it is hardly worth while making such a fuss about? This was the general opinion in the old days. It was not until 1875 that the disease was classified in Denmark as a "malignant infectious disease," for which the law requires that infected cases shall be rigorously isolated. Before that time the public authorities usually did very little to prevent the spread of infection, and, as a result, the disease showed great fluctuations, and was particularly prevalent in 1841-42 and in 1869-71.

It is quite natural that many a farmer whose stock has had the disease in a mild form thinks that the isolation is worse than the disease itself, but it is nevertheless with good reason that general opinion as to the economic significance of the disease has undergone such a remarkable change during the last thirty to forty years. As a result it is now regarded as one of the most harmful diseases among domestic animals, and the greatest efforts are now being made to keep it in check, although, unfortunately, in many places with little success.

It is true that the mortality is mostly low, usually barely half per cent. among adult animals, but young calves are very apt to die, and sucking-pigs under 14 days nearly always die when the sow gets the disease; even when older, most sucking-pigs die, and the survivors are very apt to be unthrifty.

There are many instances of the disease developing a very malignant character, with a mortality of from 5 to 50 per cent. among adult animals, and from 50 to 80 per cent. among young animals. Malignant epidemics of this kind are most apt to attack dirty and over-crowded farms, but they may also occur under favourable hygienic conditions. The disease may also occur in

a very malignant form with numerous sudden deaths reminiscent of anthrax. Such epidemics have been observed in many different countries both in former and recent times. In 1839, 2,000 head of cattle died in the Cantons of Berne and Fribourg in Switzerland; and in 1872, in the French Department of Nièvre, more than 20 per cent. of the calves and over 22 per cent. of the pigs were destroyed by the disease in the course of two months. In the summer of 1892 there died in Bavaria over 3,000 head of cattle, and in 1896 in Würtemburg, 1,500. At Barcelona, in Spain, there died in 1901, 50 to 70 per cent. of the young cattle. In Transylvania 711 out of 7,498 head of cattle, or 9.4 per cent., were destroyed in 1899. In Holstein and Schleswig the disease occurred last summer (1910) in a distinctly malignant form. According to Dr. Bugge, of Kiel, deaths occurred in practically all the large herds, and in many cases the loss amounted to 5 to 10 per cent. or over. Thus he mentioned instances in which 5 out of 20, 10 out of 80, 10 to 12 out of 100, and 10 out of 200 had died. In the September number of the *Landwirtschaftliches Wochenblatt* a tenant writes that 8 out of his 80 cows had died, and that in two villages in the neighbourhood 25 and 15 cows, respectively, had been destroyed by the disease.

However, it is not these comparatively rare cases of great mortality that cause the chief trouble. It is the acutely infectious nature of the disease which makes it so serious. When it is left alone it spreads to an enormous number of farms, and with the present quick and easy means of communication it may quite easily extend to nearly all the farms of a country or province, with the result that the aggregate of numerous small losses represents in the end an enormous sum. Thus, the loss suffered by Germany in 1892, when over 1,500,000 head of cattle, over 2,000,000 sheep and goats, and over 400,000 pigs were reported to be infected, was estimated at over 100,000,000 marks (£5,000,000), and this year (1911) the loss is sure to be much greater.

This great loss is first and foremost due to the decreased secretion of milk. During the illness itself the yield of milk is nearly always greatly reduced, often to half the normal or less. However, as soon as the animal begins to eat again it usually rises, but it is only in exceptional cases, after very light attacks. that the secretion of milk again comes up to the normal.

Mr. Andersen, veterinary surgeon at Gimlinge, who in 1892-93 had charge of the disease in the part of south-western Sjaelland which suffered most from the disease, states in his report (*Maanedskrift for Dyrlæger*, vol. X.) that many cattle-owners claimed that they were 4.8 lb. short of milk per cow daily after the epidemic. Others reckoned that they only lost 2 to 4 lb. daily, but even this small loss, if it continues throughout the milking period—which it usually does—will amount to a good deal of money. Andersen further writes: "When a cow sickens six to eight weeks before she is due to become dry, at a time when yielding 10 to 15 lb. daily, the dry period begins simultaneously with the disease." This is also an appreciable loss. Moreover, it is not unusual for a cow when attacked by the disease whilst dry to yield very little or no milk after calving, in spite of the fact that the udder is to all appearances healthy. The same may apply to cows calving whilst in the grip of the disease. Occasionally, according to Andersen, it is possible to work up the milk yield from such cows, but it seldom amounts to very much, say, one-quarter to one-half of the normal.

To this it may be added that in nearly all outbreaks some cows contract inflammation of the udder, with the result that many of these cows become more or less worthless for milking, whilst some cows get a malignant and persistent hoof complaint which weakens them greatly. Furthermore, a number of young calves and pigs die, as well as adult animals occasionally; abortion is also liable to occur; tuberculosis may sometimes suddenly attack a herd after it has been through foot-and-mouth disease—and all this without taking into account the emaciation caused by the disease (a matter of great importance when dealing with cattle fattened for killing).

It will be seen from the foregoing that it is hardly an exaggeration to estimate the economic loss from the disease at an average of 30 kroner (= 34s.) per cow. In Germany, however, the loss is put down at 50 marks (£2 10s.), and Dr. Remmelts tells me that the loss in Holland amounted to at least 25 gulden, or over £2 per cow.

To this must be added the fairly heavy expenses which are required for the proper care of the sick animals and the great loss which in many cases is the inevitable result of the isolation of stock, the issue of notices as to the boiling of milk, and the

difficulties in connection with trading, which latter may be of the utmost importance to a country like Denmark, where the export of live cattle constitutes such a valuable item of commerce.

There is thus every reason for dreading the disease and doing everything possible to prevent its gaining a firm footing.

Foot-and-Mouth Disease in Various Countries.

During the past season a tremendous wave of the disease, probably the greatest epidemic that has ever taken place, has passed over the whole of central Europe. At the end of May, 1910, it broke out in several districts of East Prussia, and simultaneously at Chemnitz in Saxony. It is said to have been introduced from Russia, and to have spread from cattle bought in a large cattle market in East Prussia. By degrees it extended from east to west over the greater part of the German Empire, and on September 15, 1911, 37,180 centres were affected.

Austria and Hungary were also severely attacked by the disease at the same time as Germany, presumably also through infection from Russia. In these countries it has taken an even greater hold than in Germany. Thus, on October 4 there were 111,382 infected centres in Austria, and on September 27, 45,563 in Croatia and Slavonia. In Hungary the disease has been very general, but is now (1911) confined to 7,961 centres.

In France 33,966 infected centres were notified in August, 1911, and in Belgium, on July 31, 5,225 centres and over 50,000 head of cattle. In Holland 12,000, and at one time as many as 18,000 centres have been notified, and Dr. Remmelts informed me lately that in the western parts of the country hardly a single herd had been spared, whilst the infection in the eastern part was less prevalent.

In Italy over 18,000 animals were attacked during the week preceding August 6, 1911, in addition to 107,000 animals over from the previous weeks. These figures show clearly enough what a scourge to cattle this disease now is in Europe.

History of Foot-and-Mouth Disease in Denmark.

This is instructive in many respects. After the fairly severe epidemic in 1869 and 1870 had died away in the course of 1871, only occasional doubtful cases occurred during the next few years, and in 1875, 1877, and 1878, there were a few series of

cases, the nature of which, however, is also partly open to doubt. Thereafter we enjoyed complete immunity until the latter part of 1892, when the disease occurred almost simultaneously in the neighbourhood of Skelskör, at Taasinge, and at Holstebro. Thence it spread fairly rapidly in south-western Sjaelland, and remained in this country until August, 1893.

In no instance was it possible to determine in what way the disease was first introduced into the country—and this was also the case with later epidemics—but there can hardly be any doubt that it came to us from Germany, which was very badly ravaged during that year. I am inclined to connect the dying out of the disease with the introduction of a very careful system of disinfection of the railway wagons used for cattle transport, this disinfection having originally been very faulty.

Later, during the next few years, there occurred a few very remarkable recurrences on estates which the disease had attacked six months to a year previously. Thus it broke out on November 20, 1893, on the Bjernedegaard estate at Sorö, where it had made itself felt for the first time on November 16, 1892; next on November 30, 1893, at Dallund (Fyen), where it had occurred for the first time in May of the same year; and on December 5, 1893, at Rynkevang, near Kallundborg, where the first cases occurred on December 12, 1892. Finally, on February 15, 1894, it broke out on the Brorupgaard estate at Slagelse, where it had occurred in March, 1893. At all four places all the cattle which had been born on the estate after the last attack were killed, and also all cattle subsequently added (respectively, twenty-one, four, thirty-five, and, I think, about forty head), whilst I let the greater part of the stock live—that is to say, all the animals which had been through the disease on the previous occasion, and all these animals showed themselves to be immune.

As during this period there was not a trace of the disease elsewhere in this country, and there could not have been any possibility of infection from abroad in any of the places mentioned (except through fodder, which is imported by all farms here), it must be assumed without a doubt that the infection had remained hidden on the farm from the previous attack.

These four recurrences at the end of six months to a year show in each instance that the virus may possess much greater tenacity than is usually supposed. It is generally taught that the

virus can be destroyed fairly quickly, say, for instance, after desiccation for twenty-four hours, and that it is fairly easily killed by means of ordinary disinfectants. But, nevertheless, it has also been found that it may remain active in an attenuated condition for three to four months in hermetically sealed glass tubes, and this is further supported by the experience which we had this year in Jutland, where the disease in the neighbourhood of Aarhus returned about three months after an outbreak and a few days after carting out the manure left from the stock which was first attacked. It is therefore advisable in practice to assume that the virus may persist for a very long time.

Of course it may be questioned whether the recurrences referred to may not be attributed to entirely different causes connected with what we have learnt in recent times about various contagious matters, as, for instance, in the case of human typhoid, where certain individuals, so-called "bacillus carriers," although apparently cured, nevertheless continue for years to give off virus, and may prove a great danger to the community as carriers of infection. In the case of foot-and-mouth disease, however, this hypothesis is controverted by the fact that I allowed the animals which had previously been through the disease to live, and that the disease nevertheless died out in the first three instances after the second outbreak and in the fourth instance after the third outbreak.

In another respect also my observations are very interesting. I refer to the question whether cattle as a rule acquire immunity by passing through the disease. On all the four farms this proved to be the case, and at Brorupgaard the immunity lasted two years. The text-books on the subject state that immunity is frequently acquired (some authors put it down at three to five or seven years), but that such immunity may in very many cases be of short duration; in fact it is asserted that cattle are quite frequently attacked by the disease several times in the course of one year. It may, however, be safely assumed that these are rare exceptions; I firmly believe that immunity is the rule. Seeing that, for instance, in Germany the disease diminishes appreciably after very widespread outbreaks, I can only conclude that this is largely due to the fact that the cattle have in many cases acquired immunity for a more or less protracted period.

During the period from August, 1893, to April, 1896, we

experienced in Denmark only the above-mentioned five cases on farms which had previously suffered from the disease. But subsequently, during the years 1896-1901, we had each year a few outbreaks, all of which were stopped very quickly by killing all the ruminants and swine on the farm.

After that we had a period of immunity until February 1, 1904, when the disease suddenly broke out in the island of Sjaelland, on a farm at Frösley in the southern part of Stevns. This herd was killed, but when the disease nine days later made its entry on the neighbouring farm, the then Minister of Agriculture would not continue the killing. Although much was done to prevent the disease from spreading, and, for instance, one and later on two veterinary surgeons were despatched to Storehedinge in order, as far as possible, to save the local men from having anything to do with the disease, it spread during the following months to twenty other herds, of which only one lay outside Stevns. In seven cases personal contact could be proved to have preceded the outbreak of the disease, and in three other cases this was probably also the cause. In one case infection was put down to mating with an infected bull. In several cases the infection was probably transmitted by the carting out of manure from infected herds. To the last place the infection was probably carried by rooks, which had a colony close by.

Subsequently, Denmark remained free from the disease for six and a half years, until November 24, 1910, since when there have been a number of outbreaks up to the present year (1912).

Ways in which the Disease is Transmitted.

As previously stated, it has not been possible in any one of the fairly numerous outbreaks of foot-and-mouth disease which we have had to deal with since October, 1892, to prove in what way the infection was conveyed to the herd which first became infected. It is a striking fact, however, that the disease has, with very few exceptions, been restricted to estates in the southern part of the country—chiefly Lolland, Langeland, South Sjaelland, Fyen, Southern Jutland (Kolding, and the neighbourhood near the Vejle Fjord); and that once only, in 1892, it attacked Holstebro, and once, in 1910, the neighbourhood west of Aarhus. An estate close to the coast has had more frequent recurrences of the disease than any. This fact is difficult to

understand on the assumption that the infection is conveyed by fodder from foreign countries, which is distributed throughout Denmark; but, on the other hand, it points distinctly to the infection being carried hither from Germany, where the disease has existed continuously. It must be a natural mode of transport, but which? I have thought for many years that it might be birds, such as gulls, crows, rooks, &c., which might conceivably fly across from Germany and carry infection on their feet, or possibly in their intestines, after having collected it from infected manure. I also do not think it impossible that the infection may have been carried by the wind. It might be a question of particles floating in the air in a free condition, or attached to the legs of insects, or possibly spiders' webs, called in Danish the "flying summer," which just at this time of the year are seen flying about in profusion.

The virus itself is not known, but it has been proved to exist in the matter contained in the vesicles, and to be liberated when these burst. Thus it comes out in the saliva, the manure (after passing through the intestines), and the matter discharged from the vesicles on hoofs and udders. It is known that the virus is a very minute object—doubtless a microbe—and that it passes through the pores of a filter; that is to say, it is smaller than the smallest of the bacteria visible under a microscope. It is likewise known that very little is needed to infect an animal with the disease, inoculation with $\frac{1}{8000}$ c.c. of the contents of a vesicle being sufficient. Such small objects do not require large means of transport.

I have not had time to examine very closely the direction of the winds prevailing at the various points where the disease has appeared, but a cursory inspection of the printed records of a meteorological institution shows that southerly, and sometimes south-westerly and south-easterly, winds have been blowing before each outbreak.

The remarkable fact that the disease may break out in an otherwise healthy country without any apparent cause has been observed several times in England, which is no more inclined than Denmark to receive animals with foot-and-mouth disease from infected countries. The theory of the wind as an infection-carrier is an old one, and in Holland observations have recently been made which seem to support it.

In Sweden, observations were once made which seem to indicate that the infection can remain for a long time with an animal which has passed through the disease. A Dutch bull was once, after undergoing the prescribed period of quarantine, imported into a herd in the far north of Sweden, and several months later this herd was visited by the disease. It was then found that the Dutch bull had a deep slit at the back of the hoof —such as is often formed during the disease when the horn comes off—and that this slit, just at the time that the disease broke out in the herd, had grown so far down as to release, presumably, the virus hidden in it. But there can be no question of any such infection in Denmark, as in no case have cattle been imported from abroad.

Whatever may be the connection between the various cases here and foreign importation, it is plain that at the present time we are very liable to receive infection from Germany. It is difficult enough to avoid its introduction through persons who have visited German cattle markets or who have come into touch with infected herds in Germany, but we are quite at a loss to cope with infection carried by birds or by the wind. The frequent occurrence of the disease at the time of year when turnip leaves are used as fodder might indicate that the latter are especially liable to carry the disease. This could not be the case if the turnip-leaves were used in the form of silage fodder. Although, for the reasons above stated, I do not believe much in the carriage of infection through foreign fodder or packing, it cannot, of course, be denied that there is something in the suspicion.

SUCCESSFUL LOCAL TREATMENT OF GOITRE.

By Dr. MILLER.

Tübingen.

Dr. Miller successfully treated a mongrel fox-terrier by daily rubbing with Ubele's ointment:—

℞ Iodi. pur.	0.5
Pot. iodidi	
Aqua destil.	āā 5.0
Adip. suill.	10.0
Adip. lan.	40.0

M. f. unguent.

The treatment lasted four weeks.—*Berliner tierärzt. Woch.*

Clinical Articles.

COCAINE AS A LOCAL ANÆSTHETIC DURING THE AMPUTATION OF A PORTION OF THE HORSE'S TAIL.

By S. J. MOTTON, M.R.C.V.S.

Penzance.

The fact that the operation of docking may occasionally be called for as the result of an accident would be a sufficient excuse for discussing the use of a local anæsthetic in connection with it.

Without treading on the vexed question as to whether one should or should not dock for other reasons, seeing that large numbers of animals are annually docked, if it became the general practice to perform the operation painlessly the bulk of the objections raised would fall to the ground.

The first case upon which I was tempted to try the effect of cocaine was a cart sucker. The tail was amputated in the ordinary way, but before searing the stump, a pad of cotton-wool soaked in 4 per cent. cocaine solution was held against the raw surface for about three minutes. The animal was absolutely unconcerned while the hot iron was being used.

The result was so satisfactory that when an eight-year-old pony mare was brought to be docked some time later a further trial was resolved upon.

This time, however, an inch above the seat of operation, 15 minims of 4 per cent. cocaine solution were injected at each of four places around the tail, these places being about equidistant from each other. Five minutes were allowed to elapse before the operation was carried out. The animal evinced no indication of pain when the tail was cut off, and apparently did not feel the searing-iron.

Since the pony was operated upon three animals have been treated in the same way (they were, respectively, two, three, and four-year-old cart animals), and each time the result has been satisfactory.

The syringe used was an ordinary hypodermic syringe with push mount. A twitch was applied in every case, and when possible a foot was held up while the hypodermic needle was being inserted. All the animals objected a little to the insertion of the needle, which was inserted slowly and with a slight rotary movement, but none behaved at all dangerously. No doubt some

animals may be met with which would be too rough to permit one to use cocaine hypodermically, but in those instances it is possible that the method adopted in my first case might prove useful.

I have not removed the twitch in either case until the "docking" has been carried out, but two of the animals were seared without the twitch being in position.

However, it may be advisable to keep the twitch on until the whole operation has been completed, for a time may arrive when the anæsthetic for some reason may fail. If the few cases recorded above prove to be anything in the nature of a fair sample, the comfort one experiences in carrying out the operation in this way more than justifies the use of cocaine.

Four per cent. solution has been used, but probably a weaker solution would act quite well.

AN INTERESTING ANEURISM IN A FOAL.

By ARTHUR ROUTLEDGE, F.R.C.V.S.
Louth.

My attention was called to a Shire filly, six months old, apparently quite well in the afternoon, but in the evening observed to be lame and stiff, and apparently in pain. When I arrived about 9 p.m. I noticed unconscious swishing of the tail, crouching, and occasional attempts to lie down. At short intervals fæces were passed in small quantity, and the foal kept looking anxiously at the flanks. The pulse was almost imperceptible, temperature of 105.4° F., mucous membranes injected, and respirations hurried and very laboured.

As I had known the animal to pass several strongyles, I diagnosed colic as being probably due to this cause, and gave a guarded prognosis. A draught composed of ether, chlorodyne, and linseed oil was administered, and hot cloths with turpentine stoups were applied to the abdomen. The body surface became very cold, the temperature rose to 106.2° F., and death occurred about 5 a.m. *Post-mortem* examination revealed a fusiform aneurism about 6 in. by 2 in. of the mesenteric artery with thickened walls, and about seventy worms (*Strongylus armatus* variety) were counted from the thrombus in the anterior.

The bowels were inflamed, and all the serous membranes were covered with petechial spots.

AN ENORMOUS OVARIAN TUMOUR.

By J. A. JORDAN, M.R.C.V.S.
Municipal Abattoir, Belfast.

The ovarian tumour, of which a photograph is herewith depicted, was taken from an aged cow, in poor condition, after slaughter in the Belfast abattoir.

She had been purchased as a "back springer," and for some time of late had had great difficulty in rising, whilst for about a week before slaughter she was unable to rise at all.

Her body was so broad across that she could not pass through an ordinary doorway. The weight of the tumour was 370 lb.

AN UNUSUAL FOREIGN BODY IN THE ŒSOPHAGUS OF A HORSE.

By A. E. ROBERTS, M.R.C.V.S.
Chepstow.

On July 19 a young cart gelding was fetched in from grass by the wagoner with the intention of being sent to work. After partly harnessing the animal he noticed something wrong, as when lifting the head to put the collar on the colt began to cough, foam at the mouth, stamp and kick, and then hang the head down, looking very distressed.

I was hastily summoned, and on getting to the farm found the floor of the box quite wet with saliva.

Suspecting some foreign body I explored the mouth, and then noticed a swelling over the œsophagus some 7 or 8 in. down the neck. Palpation revealed this to be quite hard, and as I was endeavouring to work it upwards the horse coughed violently, and brought up a piece of limestone 2 oz. in weight, of triangular shape, and measuring $1\frac{3}{4}$ in. by $1\frac{1}{2}$ in. and $\frac{3}{4}$ in. thick, with a very uneven jagged surface. The symptoms abated at once, and no subsequent treatment was necessary.

RHEUMATIC POLYARTHRITIS IN A HORSE.

By Chief Veterinary Surgeon WIEDEMANN.

A seven-year-old officer's horse fell ill at the beginning of October, 1911. The first symptoms were those of fever. Swellings of a painful nature then attacked several of the joints.

The horse was treated for sixteen days with salicylate of soda in electuary, having 150 grm. each day for four days, 100 grm. each day for four days, 50 grm. each day for four days, and a further 25 grm. each day for the last four days.

The limbs were rubbed with sol. unguent (Bengen) and wrapped in wool and bandaged.

The horse remained out of use for three months, and was then ridden again. At the end of January he was examined and found to have valvular disease developed after some endocarditis. There was compensatory hypertrophy of the heart. — *Zeitschrift für Veterinärkunde.*

GALL-STONE COLIC IN THE HORSE.

By Veterinary-Surgeon GRIMM.

On January 26, 1912, at 11 o'clock at night, the stable guard noticed that the horse "Edi" was shivering and sweating profusely. Examination showed that the horse was standing listlessly in the stall with the head depressed to the ground. He would not stand over when asked; every movement was made unwillingly, and severe pain was evident. The body was covered with cold sweat; the horse trembled all over the body. The conjunctivæ were coloured pale rosy red. The pulse by auscultation of the heart was 46, regular and

weak; heart sounds clear; heart dulness not augmented; the temperature, taken at the rectum, 38·7° C.

Breathing laboured, pumping 28 per minute; respiration forced; nothing abnormal detected in the larynx, trachea, or bronchi. Auscultation of the lungs showed increased vesicular murmur; percussion, loud resonance. No tympanites; intestinal murmurs wholly suppressed on both sides. Dung and urine had not been noticed for two days. Rectal examination showed slight twisting of the rectum to the right on its long axis, and only after rectifying its position could the examination be conducted. The bladder and posterior part of the rectum were empty. The anterior part of the intestine had a normal position, and was chock full of firm, pulpy masses of food. Treatment consisted of massage of the intestine from the flanks, in Priesnitz's compresses, and warm-water clysters. Internally the horse received chloroform, tincture of assafœtida, and tincture of opium in equal parts as a draught. After an hour and a half a draught of extract of aloes, spirits æther nit. and water, and subcutaneous injections of hydrobromate of arecolin (0·1 to 10·0 of water in fractional doses) were given.

At 2 o'clock the same night the heart-beats were weaker and irregular. Fifty grammes of camphorated oil were therefore injected subcutaneously. A quarter of an hour afterwards the heart-beats were quieter and stronger, and in a further quarter of an hour the pulse was 60, but weak. Breathing remained laboured and pumping, and went up to 60 per minute. Conjunctivæ pale red and almost white.

At 6 o'clock the horse stood with propped limbs and sunken head. Dung and urine were not passed; no intestinal sounds. Suddenly the horse fell on its side and died.

Post-mortem showed: Anæmia of the external visible mucous membranes, bloody serous exudate in the abdominal cavity, stoppage of big masses of food in the large colon, and thin, pulpy fluid in the small intestine, enteritis, cirrhosis of the liver, gall-stones, parenchymatous inflammation of the heart muscle, hæmorrhages under the pericardium, especially at its apex.

The changes in the liver were remarkable: the right lobes were yellowish brown and the left dark brown in colour, swollen, and had rounded-off edges. They were three times their normal size, consistency hard. On its surface the liver was nodular, and at the

top of the knots clear coloured. On incising the right lobe a yellowish-red, penetrating, stinking fluid escaped. Gall ducts greatly distended, filled with this fluid, and walls greatly thickened. In the left lobe the gall ducts were much dilated, and their walls $\frac{3}{4}$ cm. thick. Little gall-stones were found throughout these ducts to the number of several hundred. In the chief exit there was a yellow structure as big as a pigeon's egg ; its long diameter measured 4 cm. The colic in this horse seemed to be intimately connected with the presence of gall-stones.

It was remarkable that during the whole course of the ailment there was complete absence of jaundice.—*Zeitschrift für Veterinärkunde.*

FATAL PERITONITIS AS THE RESULT OF PERFORATION OF THE INTESTINE BY THE STEM OF A PLANT IN THE HORSE.

By LÉTARDI.

The subject of this note, a horse, at first showed decline of appetite and slight colic. Temperature 37·8° C. Intermittent griping pains, later on, fever. Increase in seriousness of symptoms, and death after four days. *Post-mortem* : In the abdominal cavity about 15 litres of purulent fluid ; cæcum, end portions of the ileum and large colon covered with thick membranes. In the middle of the false membranes a purulent mass in the depths of which a foreign body was present, which had penetrated the cæcum. This body consisted of the stalk of a herbaceous plant, probably lucerne.—*Der Tierarzt.*

STONE IN THE URETHRA OF A MARE.

By EGGINK.

Symptoms : Incontinence of urine. Each time on lying down a certain amount of turbid urine was passed from the under commissure of the vulva along the buttocks, skin acutely inflamed, hair fallen out, slight emaciation, loss of appetite, increased thirst. On vaginal exploration E. found a hard swelling about the size of a hen's egg. The finger introduced into the bladder revealed a mass of firm consistency, consisting of several fragments, corresponding to each other, which filled out the bladder cavity. With the finger E. removed a

number of hazel nut to walnut sized stones which were superficially facetted, besides the bladder contained gravelly urine and its wall was much hypertrophied. Treatment consisted in irrigations of warm boracic acid twice daily, 2 grm. of salicylic, then irrigations with silver nitrate 1-2 per cent., zinc sulphate 1-2 per cent., potassium permanganate; salol 2-10 grm. per day. The mare had a difficult parturition the year previously, embryotomy having to be performed. Some time after she urinated frequently, and then incontinence of urine came on. E. believes that in carrying out embryotomy a traumatic vaginitis arose, which by continuity extended to the bladder and produced infectious catarrh of the bladder and cystic calculi.—*Der Tierarzt.*

CASTRATION STANDING.

By DEST V. S. REIMER.

Freiburg.

For opening the scrotum Reimer uses a specially handy instrument, a so-called hook-bistouri, made by the firm of Hauptner. He claims that by its use a deep incision through the scrotum, dartos, and tunica vaginalis can be made. The parenchyma of the testicle is always reached, and it drops out well. The length of the instrument enables the operator to avoid too close contact with the flank and thigh of the horse. Reimer thinks that the compression castrator (similar to the "Reliance" and "Huish-Blake") checks hæmorrhage more effectually than the emasculator.—*Berliner tierärzt. Woch.*

A CASE OF ROARING AS A RESULT OF A PRIMARY TRACHEAL SARCOMA.

By Professor KÄRUBACH, Berlin.

The author asserts that hitherto primary tracheal sarcomata in the horse have been very rarely noticed, and that a primary tracheal sarcoma has never been the object of veterinary examination. A healthy horse had made a whistling sound for two years at hauling work. The usefulness of the animal was not at first impaired. The following year the whistling sound increased in strength, there was difficulty in breathing, and the animal repeatedly came to a standstill.

As catarrh of the air passage developed in addition the horse roared and the difficulty in breathing became so intense at work that suffocation threatened. Since tracheotomy produced no benefit a tumour in the trachea was suspected. This suspicion was verified by passing a sound, and at the autopsy microscopic examination showed a large round-celled sarcoma that had its origin in the region of the submucosa. The benignness of the tumour accounted for the small affection of the neighbourhood and the slow growth (two years). —*Deutsche tierarzt. Woch.*

Canine and Feline Clinicals.

UNSUSPECTED FRACTURE OF THE ATLAS IN A CAT.

By E. B. REYNOLDS, M.R.C.V.S.
Professor in the Royal Veterinary College, London.

The following case appears worthy of being recorded, if only for the fact that such a serious and long-standing lesion as was revealed at the *post-mortem* examination had been unaccompanied by any noticeable symptoms until so late on in the condition.

The subject was a one-year-old castrated male cat. The history was that about seven weeks previously a small abscess had formed just behind the right ear; this had been opened and dressed, but at no time had the wound quite healed. The cat had always appeared to be in good health, and quite playful up to two days before being brought for treatment. It was then noticed that it had some difficulty in standing; it rapidly became worse. The cat on examination was found to be in a semi-comatose condition, and quite unable to make any movement or support itself in any position whatever. About three-quarters of an inch behind the base of the right ear, and at a point situated about the middle of the outer edge of the wing of the atlas, was a small opening through the skin just large enough to admit a small silver probe. This could be passed inwards and slightly upwards to the inner part of the anterior edge of the wing. No bare bone could be detected, but on withdrawing the probe a drop of dark-coloured pus escaped, this having the characteristic smell of necrotic bone.

A definite diagnosis was not attempted, but from the acute symptoms present it was apparent that, whatever the bone lesion,

the spinal cord was seriously involved, so destruction was advised.

Post-mortem examination showed that a fracture of the atlas had taken place some time previously. The lower half of the right articular cavity, which consists of a thin shelf of bone, had been completely broken away; this piece of bone, a quarter of an inch long and eighth of an inch wide at its middle, had become necrotic, and was no doubt responsible for any subsequent lesions. The whole right half of the atlas, including the wing, was the seat of an extensive rarefying ostitis with some degree of bulging into the neural ring. There was considerable ossific deposit on the occipital bone to the outer side of the right condyle and along the under surface of the basilar process; the lower half of the right condyle, corresponding to the detached part of the articular cavity of the atlas showed ulceration, the articular cartilage having disappeared from its surface; suppuration had extended just into the neural canal through the occipito-atlantal ligament, setting up an acute inflammation of the structures surrounding the spinal cord. It is likely that this extension to the neural canal was of recent occurrence, and accounted for the onset of the serious symptoms.

After discovery of the exact nature of the lesion further inquiries were made of the owner as to the presence of any earlier symptoms. He again stated that none whatever had been noticed, and that as the cat had been a constant pet they would have been observed had they occurred.

A CASE OF DELIBERATE SUICIDE IN A DOG.

By J. BENSON.

A NUMBER of cases of deliberate suicide in animals have lately been reported in the lay papers, and although I am not a veterinary surgeon, I have lived all my life amongst animals, and am not hysterical about them, so thought that perhaps the readers of THE VETERINARY JOURNAL would be interested in the following fact of which I was an eye-witness.

The subject was a smooth-haired collie bitch, the property of a yeoman farmer, and was suffering from a very painful affection of the ears, accompanied by constant discharge.

I saw her myself deliberately walk into a pool, and hold her head under the surface of the water until she was drowned. I did not understand her peculiar action until it was too late to attempt to save her.

A TUMOROUS SWELLING ON THE NOSE OF A CAT.

By GUY SUTTON, F.R.C.V.S.
Kensington, W.

THE photograph is that of a three-year-old male cat, on whose face a small swelling was first noticed about six months ago, the owner attributing it to be the result of a rat bite. From the onset the growth of the enlargement was slow but regular, and when brought for advice in October the swelling had reached the size of half a walnut, and the face was distorted, as shown in the photograph.

The clinical picture the animal presented was identical with that shown on p. 89 of Hobday's "Clinical and Feline Surgery," which was identified microscopically as a granuloma. Unfortunately, permission to remove a portion for examination could not be obtained, as the cat was such a great pet.

CARCINOMA OF THE ŒSOPHAGUS OF A CAT.

By GEO. H. WOOLDRIDGE, F.R.C.V.S.
Professor in the Royal Veterinary College, London.

THE subject of this note was an aged female tabby cat, which was brought to the College in a very weak and emaciated condition. The owner was of opinion that there was a bone stuck in the throat or gullet. Although the cat had been wasting for a considerable time, she had suddenly got much worse, and was unable to swallow solid food. When she attempted to take liquids, such as milk, she was unable to retain them. On examination there was no obstruction to be found in the mouth or pharynx, nor could any obstruction be found at first in the cervical portion of the œsophagus. A probang was then passed, and some obstruction was encountered at the base of the neck about the level of the two first ribs. On more thorough manipulation a firm, apparently flexible body, could be felt in this position, and, as the owner intimated that the last solid meal partaken of by the cat consisted of haddock, it was suspected that the obstruction was probably a fish-bone. Œsophagotomy was accordingly recommended, and permission to operate was given, the owner being informed of the danger of collapse under the anæsthetic, as the cat was almost in a collapsed state already.

The animal was anæsthetized with A.C.E. mixture in the sterno-abdominal posture, the hair having been removed from the site of operation. She was then turned over, and the necessary area disinfected with pure tincture of iodine. An incision was made about an inch long, and the deep structures of the neck exposed. The œsophagus was difficult to identify, and the probang was re-inserted in order to facilitate identification. The gullet was then incised and the obstruction partly exposed. It was found not to consist of a foreign body, but was in the nature of a new growth. A probe could be passed alongside it down the gullet, but the channel was almost occluded. The growth had a broad diffuse base, and consequently could not be excised; moreover, for most of its extent it was in an inaccessible position. It was decided to remove it by means of the curette and this was done sufficiently to allow the probang to pass freely into the stomach. After disinfection the wound was closed by means of a single row of

fine silk interrupted sutures in the œsophageal wall, and stronger sutures through the skin. The cat withstood the anæsthetic better than was anticipated, but it was not expected that she would recover from the operation owing to her weak condition. She died twenty-four hours later.

A *post-mortem* examination was made. The body was in an extremely emaciated condition, probably due to the animal being unable to swallow food, and on exposing the interior of the œsophagus it was found that the growth had occupied a base about an inch and a quarter in diameter in the commencement of the thoracic portion, and that sufficient of it had been left to permit of sections being cut for microscopic examination. No other tumour formation was observed elsewhere in the body, but the liver was the seat of chronic venous congestion, and fatty infiltration. On microscopic examination the growth was found to be carcinoma, a condition which in my experience is extremely rare in the cat in this situation.

SOME CANINE CLINICAL NOTES.

By FREDERICK HOBDAY, F.R.C.V.S.

Kensington, W.

Fracture of each Humerus at the same time.

The subject was a black and tan Manchester terrier bitch, five months old, and was stated by the owner to have sustained the injury by having jumped off a table.

Symptoms.—The typical position for fractured fore-legs, *viz.*, sitting upon metatarsals like a kangaroo, with fore-legs hanging between hind pads.

Diagnosis.—Fracture of distal end of each humerus.

Prognosis.—Favourable, but probable stiff legs as a sequel.

Treatment.—Fractures set in gum bandages, and bitch ordered to be kept quiet and fed on rice and bread and milk.

Ten days afterwards the bandages were removed, but as the fractured bones still crepitated the legs were re-bandaged.

Three weeks later the dog brought up for inspection, and the bandages were removed. One fracture had united, the other still needed support, and was re-bandaged. Ultimately both made a good recovery.

Two Cases of Ranula.

Case 1.—A spaniel 1 year old.

Case 2.—A Newfoundland 3 or 4 years old.

In each case the mouth was open, and saliva was escaping freely.

History.—Each dog had difficulty in swallowing, which increased, till at last no solid food could be taken. The spaniel's ranula had formed to the size of a small walnut in about four days.

Examination revealed a large fluctuating swelling under the tongue in each case.

Each dog was hobbled, chloroformed, and the ranula lanced, when ropy saliva and mucus exuded from it. About half of the lower wall of the cyst was removed with a pair of curved scissors, and the mouth washed out with a solution of boracic acid.

After-treatment consisted in the administration of pot. iod., with applications of alum and boracic acid as a mouth wash three times a day.

Ropy saliva continued to flow in *Case* 1 for a week, and in *Case* 2 for about three weeks, but each eventually made an excellent recovery.

A Case of Double Intussusception.

The subject was a black and white Pomeranian bitch, one month old, which was observed to be ill one night, with others of the litter (which were afterwards treated for distemper), and died the next morning after admission to hospital.

Post-mortem revealed two intussusceptions of the large intestine, each about 1 in. in length and about 3 in. from each other. Three large worms (*Ascaris marginata*) were found in the stomach.

Successful Passage of a large Fish-hook through the Intestine.

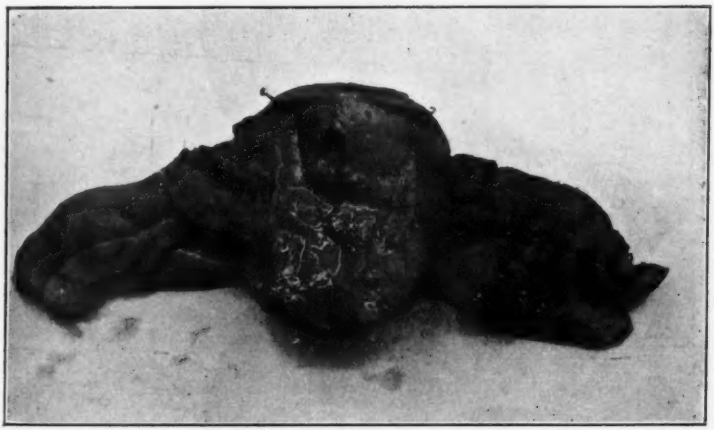
Early in the month a client wrote for advice regarding a fox-terrier puppy about five months old, which had swallowed an ordinary eel fish-hook rather more than an inch in length.

A dietary consisting entirely of suet pudding was given, and the hook was passed in a natural manner about forty-eight hours after being swallowed.

A Case of Sarcoma of the Intestinal Wall.

Recorded cases of sarcoma in the tissue of the wall of the intestine are not common, but when they do occur they are invariably fatal.

The patient in this case was a poodle bitch about 9 years old, for which veterinary aid was sought on account of persistent attacks of sickness. These were generally got under control with doses of bismuth, but always returned, and the dog's appetite now became very capricious. As there was a considerable amount of pyorrhœa the teeth were attended to, several being extracted, and the gums dressed with astringent lotion. For a week the dog was decidedly better, but diarrhœa set in as a complication,



Small-celled Sarcoma of the Intestine of a Dog.

and this could not be checked. Finally Mr. Willett, M.R.C.V.S., was called in consultation, and eventually, as the animal was becoming thinner and evidently in pain and very miserable, it was destroyed.

Post-mortem examination revealed the presence of a tumour about the size of a large filbert nut, with an ulcerating centre, embedded in the wall of the first part of the large intestine, the growth penetrating the whole thickness of the wall.

Microscopical examination revealed the structure to be that of a small round-celled sarcoma.

AN INTERESTING MONSTROSITY.

The monstrosity which is here depicted by the sketch is one which was brought to me by a client and was brought into the world by a black and tan terrier bitch, being the only progeny of the service.

It is especially interesting from the point of view that there are two fœtuses joined together, the whole eight legs being fully developed on the one body, and both are females. The

latter seems to be an invariable rule, and on the authority of Sir John Bland Sutton, F.R.C.S. I understand that the fact of the two bodies joined together being always of the one sex is invariable. Here the particular peculiarity is that the fore legs of the second body are attached to what ought to be the nose and nostrils of the first, and also that there is only one set of internal organs to the two.

The specimen is now in the hands of Dr. Shattock and will be preserved in the Museum of the Royal College of Surgeons, Lincoln's Inn Fields, where it can be examined by anyone who cares to see it in its entirety.

An Interesting Case of Ascites.

The patient, a fox-terrier, 14 years old, a very great favourite, first began to show signs of an enlarged abdomen in November, 1911, and we were called in on December 1. Ascites was diagnosed, and nearly two quarts of fluid were removed from the abdomen. The old dog had asthma very seriously, and was in too much discomfort to sleep or even to lie down before the operation. Instant relief was obtained after the fluid had been removed, and the patient passed a quiet night. Potassium iodide was prescribed internally, together with quinine, and all went well until the 19th, when the fluid had accumulated again to a point of discomfort, and the trocar was used with the same beneficial effect as before. Between December, 1911, and August, 1912, the abdomen was tapped, either by my partner, Mr. Sutton, F.R.C.V.S., or myself, no less than twenty-one times, amounts varying from one and a half to four pints being taken away each time. Relief was always immediate, and when death did come it came suddenly after a coughing fit, apparently from syncope.

At no time was there any evidence of peritonitis as a result of the tapping, and this point is of interest as an illustration of the absolute fearlessness with which one may enter the abdomen if only antiseptic details are attended to.

In this case the trocar was always carefully boiled, and the skin painted with tincture of iodine on, and after, each operation.

Report.

TENTH INTERNATIONAL VETERINARY CONGRESS, LONDON, 1914.

At a meeting of the Organizing Committee, held on Friday, October 11, 1912, the following titles of subjects for discussion at the Tenth International Veterinary Congress (to be presented for consideration to the Permanent International Commission at Lyons) were agreed to:—

General Meetings.

Foot-and-Mouth Disease.—Tuberculosis.

Section I.

Veterinary Science in relation to Public Health.

(1) Meat poisoning—its pathogenesis and the measures necessary to guard against it.

(2) General principles to be observed in the inspection of the carcases and organs of tuberculous animals with a view to determining their safety as articles of human food.

(3) Public control of the production, distribution, and sale of milk in the interests of human health.

(4) Disinfection of wagons.

Section II.

Pathology and Bacteriology.

(1) Johne's Disease.

(2) Bovine Piroplasmoses (European), with special reference to their etiology.

(3) The relationship of the so-called types of tubercle bacilli.

(4) Ultra-visible viruses.

(5) Distemper—etiology and vaccination.

Section III.

Epizootiology.

(1) Anthrax.

(2) Abortion.

(3) Swine Fever.

(4) Glanders.

Section IV.

Veterinary Medicine and Surgery.

(1) Anæsthesia—local and general.

(2) Laminitis.

(3) Roaring in horses.

(4) The use of drugs in the treatment of diseases caused by nematode worms.

(5) Sarcoptic mange in horses.

SECTION V.

Tropical Diseases.

(1) The piroplasmoses (excluding redwater).
(2) Methods of dealing with ticks concerned in the transmission of disease.
(3) Trypanosomiasis of animals.

Review.

Veterinary Physiology. By Major-General F. Smith, F.R.C.V.S., C.B., C.M.G. Fourth Edition, revised and re-written. Demy 8vo, pp. xii + 808. 259 illustrations, including one coloured plate. Price 18s. net. Published by Baillière, Tindall and Cox, London.

Although this is the fourth edition of General Smith's work on Veterinary Physiology, it represents so many new features, having been almost entirely re-written, that more than passing mention is necessary. The number of pages has been increased by nearly one hundred, and the type has been set so much closer that the book contains almost double the matter of the previous editions, and yet the volume is only about the same size. The subject is dealt with in the same order as in previous editions, and the chapters correspond.

It is not possible, nor indeed is it necessary, to criticize the work in detail, and it would be invidious to pick out one part for special mention when all is so excellent. In this edition General Smith has given us of his best, and we have no hesitation in recommending all who possess even his third edition to invest still further, and procure this, the fourth edition, in which the various phases of Veterinary Physiology have been brought right up to date.

There are several points, however, to which we should like to refer. One of these is in reference to the nature of the so-called "blood platelets." At the present time, when the examination of blood in the investigation of hæmatozoic affections is being pursued, it would appear to us advisable that a little more attention might with advantage have been paid to these bodies. The author appears to support the view that "blood platelets" are distinct cellular elements, and very little is said with regard to other theories concerning them. One important theory held by Buckmaster and others is that "blood platelets" represent one of the first stages in the process of coagulation, and that they do not exist as distinct elements in normal blood. He considers that they occur only in blood coagulating very slowly, and when seen in microscopic preparations they should be regarded as artefacts. It would perhaps be an advantage if this matter were discussed a little more fully.

The section dealing with internal secretions is more comprehensive than in previous editions, and the functions of the pituitary body are dealt with more fully. There is, however, a probable function associated with this body to which reference is not made, and that is with regard to its possible association with the functions of the generative apparatus. It has been ascertained clinically that extracts of the bulbar portion of the pituitary body exert a marked influence on the contractions of the uterine wall in cases of prolonged parturition. We do not know how this effect is brought about, but there would appear to be no doubt about the association of the pituitary secretion with the contractions in labour. The chapter on locomotion has been enlarged and new excellent diagrams introduced.

Two other useful additions in this volume refer to the influence of age in horses on the capacity for work, and in the section on ferments in the latter connection there is a very useful and interesting table summarizing the various ferments employed in digestion and nutrition, where they are found, and their actions.

Following the index, which is very comprehensive, is a list of authorities quoted in the text. There is also a list of *corrigenda*, to which might have been added the correction of the word attendi*h*g for attending on page 192, line 33.

The work of the publishers in the production of the volume is all that can be desired. G. H. W.

LITERARY NOTE.

Messrs. Bailliere, Tindall and Cox announce that they have just published an English translation of Hutyra and Marek's "Special Pathology and Therapeutics of the Diseases of Domestic Animals."

The merit of this work is proclaimed by the fact that it has, in its original form, passed through three editions in two years, and has been adopted as a text-book by the Veterinary Colleges of Germany, Austria, and Hungary. It has also been translated into Italian, and a Russian edition is in preparation. The Veterinary profession at home is under a debt of gratitude to the translators, Drs. John Möhler and Adolph Eichhorn for having made such a work more readily accessible.

It will be in two large octavo volumes, comprising 2,300 pages, with about 400 illustrations, many of which are coloured, and the price complete will be £3 3s. net. Only the first volume is ready at present. It treats of the infectious diseases, diseases of blood and of the hæmatopoietic organs, disease of metabolism, of the spleen, urinary, and circulatory organs. The advance orders for this book in America have been so unexpectedly numerous that the supply now available is limited, and prospective purchasers should order at once if they do not wish to be disappointed.

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Fellowship Degree.

A meeting of the Board of Examiners for this degree was held at the College, 10, Red Lion Square, W.C., on Saturday, December 7. The following is a list of the successful candidates, together with the title of their respective theses:—

Lieutenant R. F. Stirling, "East Coast Fever in Rhodesia, and its Control"; Mr. R. G. Anderson, "Inflammatory Diseases affecting the Udder of the Cow."

The examiners were Messrs. J. Malcolm, W. Hunting, Professor Macqueen; Mr. W. J. Mulvey being in the chair.

Fred Bullock, *Secretary.*

Examinations in London.

At the examinations held in London in December, the following gentlemen passed their Final Examination, and were admitted Members of the Royal College of Veterinary Surgeons:—

Mr. J. Bradley	Mr. W. E. Petty
,, S. E. Hill	,, E. M. Robinson
,, C. J. R. Lawrence	,, S. L. Slocock*
,, R. A. Murless	,, P. L. Thierry
,, W. F. Poulton	,, S. H. L. Woods

The following gentlemen passed their Third Examination:—

Mr. A. H. Adams	Mr. G. F. Marais*
,, W. P. S. Edwards	,, B. J. W. Nicholas
,, R. C. G. Hancock	,, M. G. J. O'Connell
,, W. B. Howe*	,, W. H. Priston
,, G. C. Harding*	,, H. A. Thorne
,, H. A. King	,, H. S. Wright

The following passed their Second Examination:—

Mr. J. Daly*	Mr. P. S. Sparling
,, J. A. Edwards	,, J. H. Stewart
,, R. W. D. Easom	,, G. Simons
,, T. S. Roberts	,, K. S. Simpson

The following passed their First Examination:—

Mr. H. W. Brekke	Mr. A. Temple
,, G. H. Bennet	,, T. H. A. Turner
,, L. St. Bel. Golledge	,, P. F. Woodland
,, J. F. Hedley	

Marked thus (*) passed with Second-class Honours.

EXAMINATIONS IN DUBLIN.

The following gentlemen passed their Final Examination and were admitted Members of the Royal College of Veterinary Surgeons:—

Mr. T. G. Carroll
,, W. L. Flanagan
,, M. J. Glynn
,, M. McClancy
,, W. H. Power
Mr. T. F. Quirke
,, P. J. Shiel
,, W. P. Walsh
,, R. C. Wheeler

The following passed their Third Examination:—

Mr. A. E. Brandon
,, T. D. Condell
,, P. D. Huston
,, J. C. P. McFarlan
Mr. E. S. M. Morgan
,, M. H. Reid
,, J. Shannon

The following passed their Second Examination:—

Mr. T. A. Connolly
,, G. J. Delaney
,, M. J. Flynn
Mr. R. Haws
,, G. K. Shaw

The following passed their First Examination:—

Mr. E. J. Allen
,, S. J. Cotton
,, J. M. Currie
,, J. Leigh
Mr. D. Mahony
,, C. O'Driscoll*
,, M. McCartin

EXAMINATIONS IN GLASGOW.

AT a meeting of the Board of Examiners held in Glasgow on December 9, for the Written, and on December 11 and 12, for the Oral and Practical Examinations, the following gentleman passed his Final Examination:—

Mr. P. J. Turner.

The following passed their Third Examination:—

Mr. O. A. Stewart
,, W. Barr
Mr. E. Angler

The following passed their First Examination:—

Mr. H. J. Hughes*
Mr. C. McPherson

LIVERPOOL (EXAMINED AT GLASGOW).

The following passed their Third Examination:—

Mr. M. W. Holland
Mr. R. L. Lewis*

The following passed their First Examination:—

Mr. E. W. Hughes*
Mr. W. L. Marshall

Marked thus (*) passed with Second-class Honours.

EXAMINATIONS IN EDINBURGH.

At a meeting of the Board of Examiners held in Edinburgh on December 9, for the Written, and on December 11, 13, and 14, for the Oral and Practical Examinations, the following gentlemen passed their Final Examination:—

Mr. J. N. Cooper	Mr. A. Q. Hall
,, W. Dalling	,, S. E. Holmes
,, R. L. Armour	,, C. Nicholson
,, F. J. L. Croudace	,, D. R. Williamson
,, R. E. Drennan	

The following passed their Third Examination:—

Mr. L. Anderson	Mr. E. Sewell
,, D. Starkey	,, G. Williamson

The following passed their Second Examination:—

Mr. R. E. Bond	Mr. W. J. Bambridge
,, R. J. Forrest	,, P. MacLaughlin
,, P. W. Walker	,, L. Littler

The following passed their First Examination:—

Mr. R. Beattie	Mr. J. G. E. Gallie
,, H. F. Downie	,, A. B. Kerr

EXAMINATIONS IN LIVERPOOL.

At a meeting of the Board of Examiners held in Liverpool on December 9, for the Written, and on December 16 for the Oral and Practical Examination, the following gentlemen passed their Final Examination:—

Mr. V. A. Bartrum	Mr. A. L. Pollard
,, R. Isherwood*	,, J. W. Procter
,, A. D. Morgan	

Marked thus * passed with Second Class Honours.

UNIVERSITY OF LONDON.

Faculty of Science (Veterinary Science).

GENERAL INTERMEDIATE EXAMINATION (PART II) FOR INTERNAL STUDENTS.

PASS LIST, 1912.

1801. Grey, Gerald Omar Rushie, Royal Veterinary College.
1802. Hancock, Reginald Cuthbert Greatrex, Royal Veterinary College.
1803. Horton, Frank Fielding, Royal Veterinary College.

1804. Marais, Guillaume François, Royal Veterinary College.
1805. Minett, Francis Colin, Royal Veterinary College.

Examiners.—Veterinary Physiology: G. A. Buckmaster; W. L. Symes.

B.Sc. Examination for Internal Students.

Pass List, 1912.

1901. Edwards, James Thomas, Royal Veterinary College.
1902. Horton, Frank Fielding, Royal Veterinary College.
1903. Minett, Francis Colin, Royal Veterinary College.

Examiners.—Veterinary Hygiene: G. H. Wooldridge. Veterinary Pathology: John McFadyean; A. E. Mettam.

Letters and Communications, &c.

The Registrar of the Royal Veterinary College of Ireland; Dr. Ireland; Mr. L. Edwards; Mr. J. A. Jordan; Mr. A. E. Roberts; Mr. A. Routledge; Mr. S. J. Motton; Professor Reynolds; Mr. G. Sutton; Mr. J. Benson; Professor Antonini; Professor Liautard.

Books and Periodicals, &c., Received.

The American Veterinary Review; Journal of the Royal Army Medical Corps; Recueil de Médecine Vétérinaire; L'Hygiène de la Viande et du Lait; Revue Générale de Médecine Vétérinaire; Der Tierarzt; Zeitschrift für Veterinärkunde; Berliner tierärztliche Wochenschrift; Osterreichische Wochenschrift für Tierheilkunde; La Clinica Veterinaria; Revista de Medicina Veterinaria; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Kennel Gazette; Agricultural Journals for the Union of South Africa and for Rhodesia; American Journal of Veterinary Medicine.

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the Journal should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.